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Kosaka

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(54) **SPRAY GUN WITH IMPROVED TRIGGER RETAINING SHAFT**

(71) Applicant: **ANEST IWATA Corporation**, Kanagawa (JP)

(72) Inventor: **Shozo Kosaka**, Kanagawa (JP)

(73) Assignee: **ANEST IWATA CORPORATION**, Kanagawa (JP)

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B05B 9/01 (2006.01)
B05B 12/00 (2006.01)

(52) **U.S. Cl.**
CPC . ***B05B 9/01*** (2013.01); ***B05B 7/02*** (2013.01); ***B05B 12/002*** (2013.01)

(58) **Field of Classification Search**
CPC B05B 9/01; B05B 15/06; B05B 7/02; B05B 12/002
USPC 239/600
See application file for complete search history.

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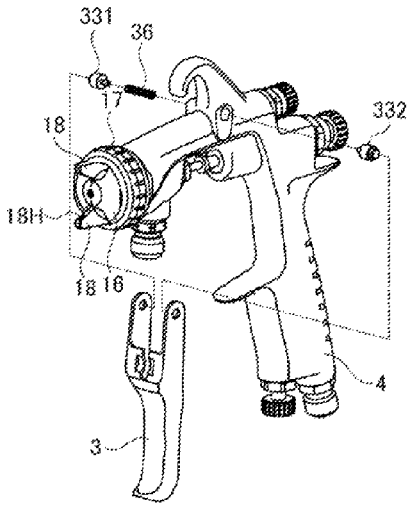
Primary Examiner — Ryan Reis
(74) *Attorney, Agent, or Firm* — Wenderoth, Lind & Ponack, L.L.P.

(57) **ABSTRACT**

There is provided a spray gun comprising: a gun main body; and a trigger having a first locking portion and a second locking portion, the first locking portion locked at one end of a shaft portion provided on the gun main body, the second locking portion locked at the other end of the shaft portion, the trigger operable to rotate about the shaft portion, wherein the shaft portion comprises: a first retaining shaft disposed in a mounting hole formed in the gun main body and locked rotatably on the first locking portion of the trigger; and an elastic member disposed in the mounting hole to bias the first retaining shaft in a direction in which the first retaining shaft exits from the mounting hole.

10 Claims, 7 Drawing Sheets



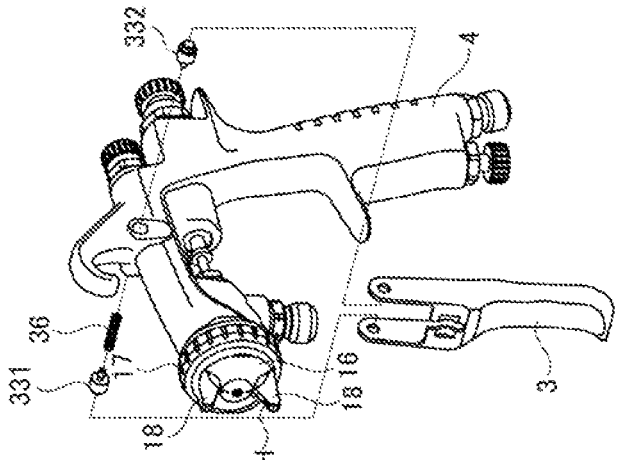


Fig. 1C

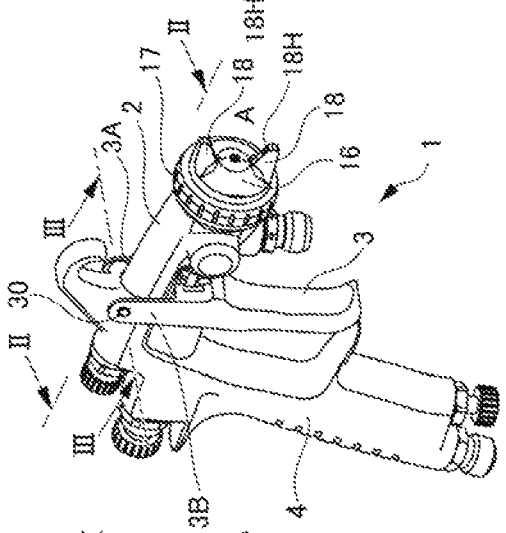


Fig. 1B

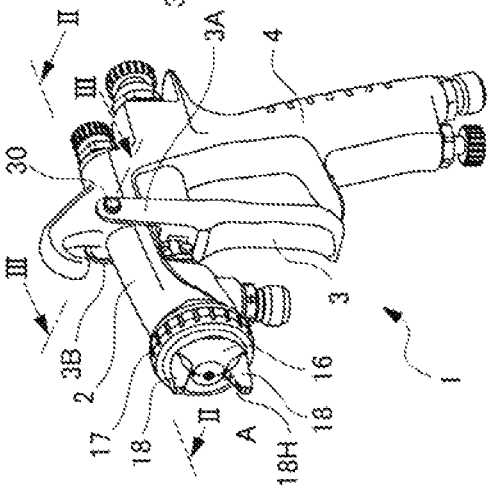


Fig. 1A

Fig. 2

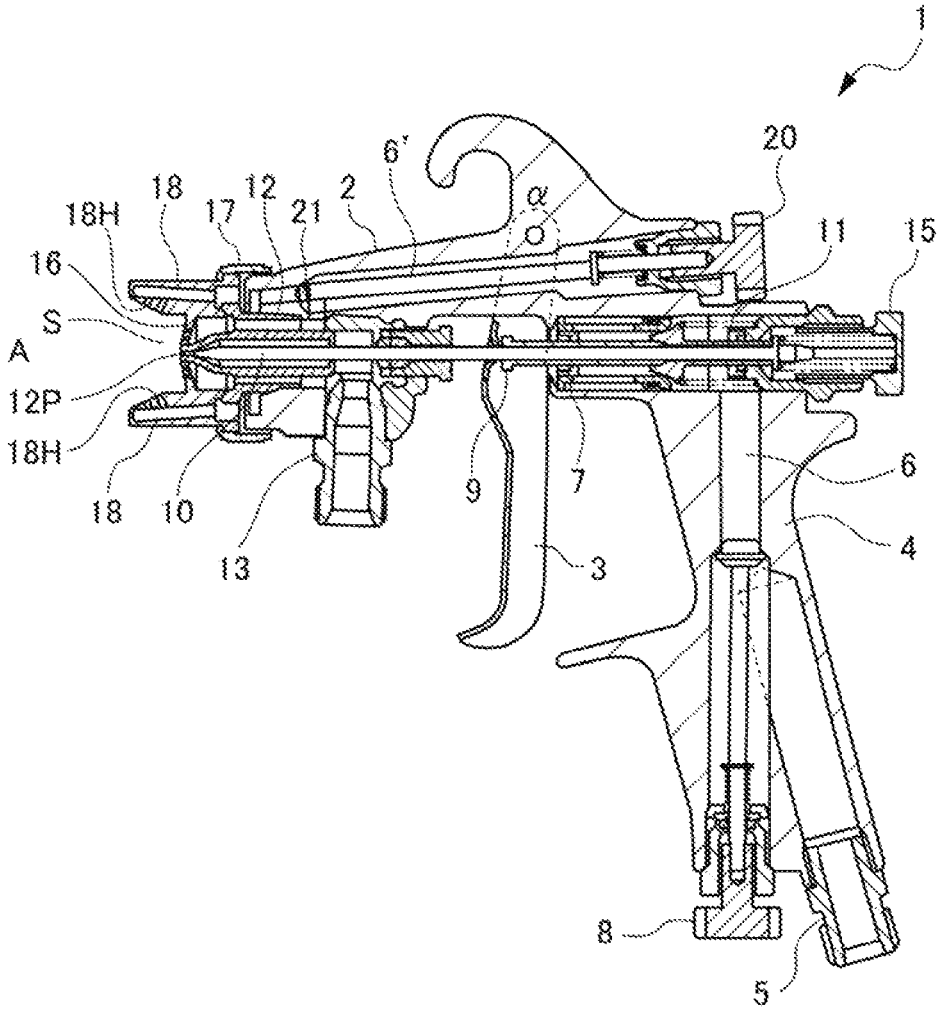


Fig. 3C

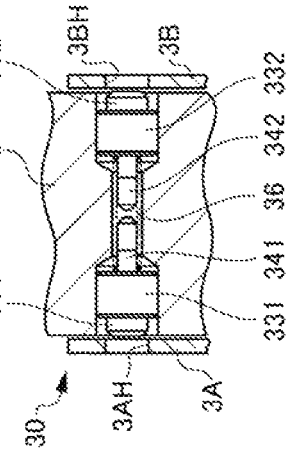


Fig. 3B

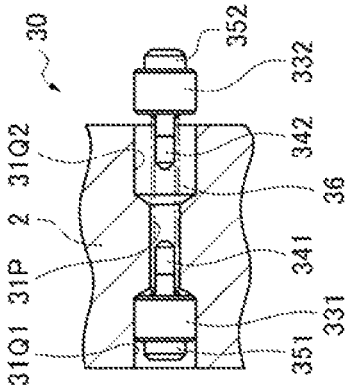


Fig. 3A

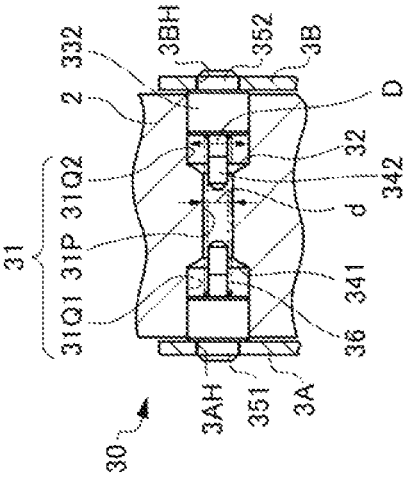


Fig. 4C

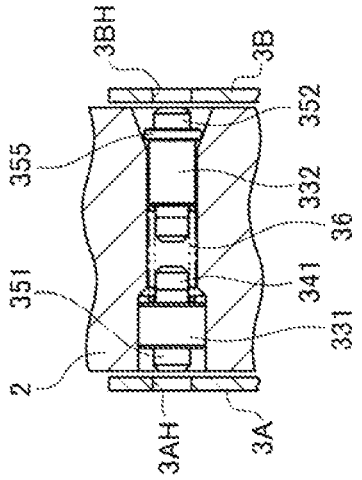


Fig. 4B

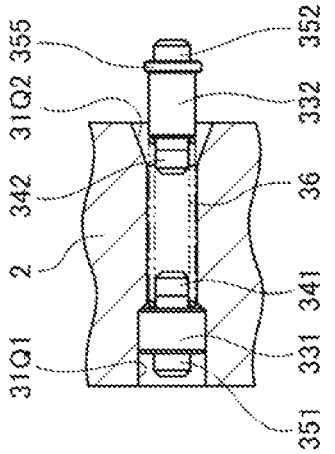


Fig. 4A

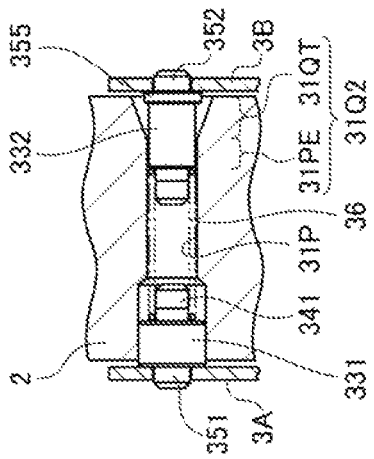


Fig. 5A

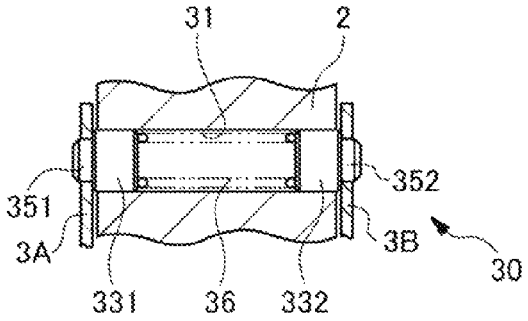


Fig. 5B

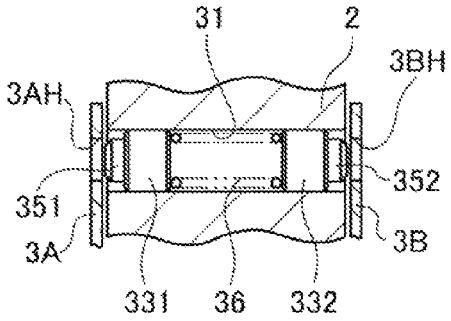


Fig. 6A

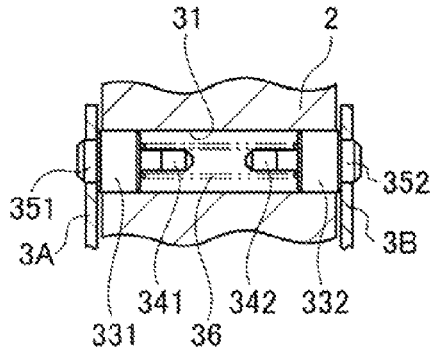


Fig. 6B

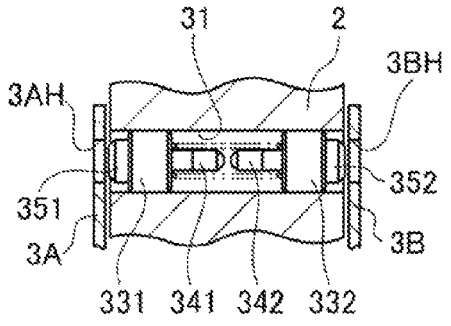


Fig. 7A

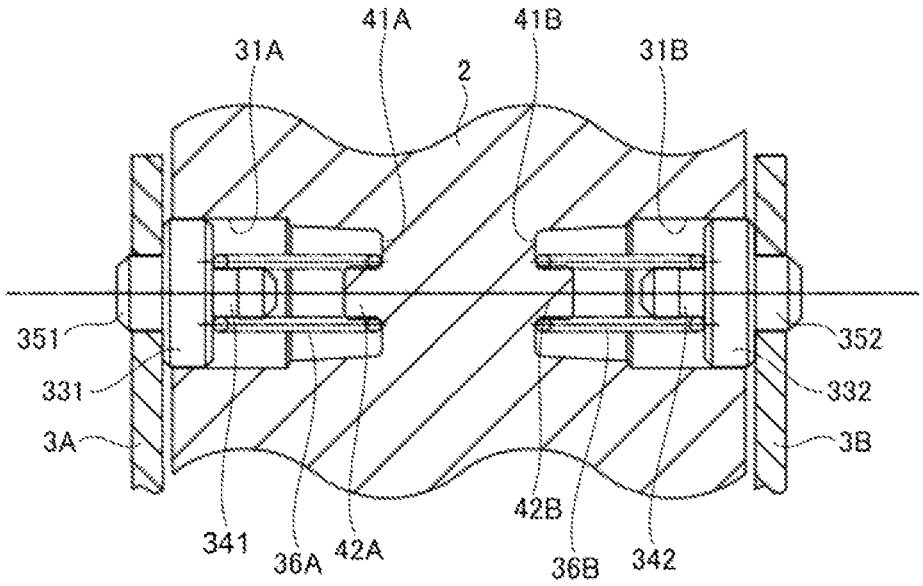

41A
41B
31A
2
31B
351
352
331
332
3A
3B
42B
341
36A
42A
36B
342

Fig. 7B

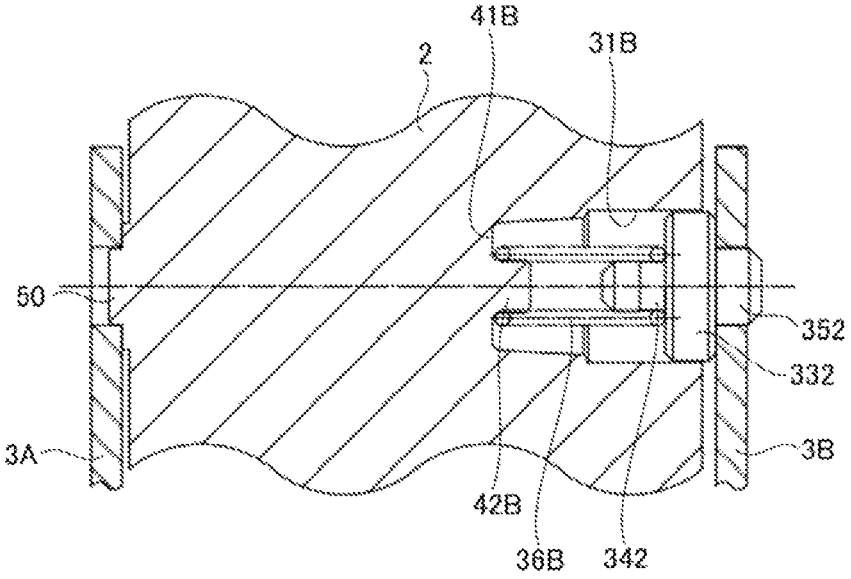

41B
2
31B
50
352
332
3A
3B
42B
36B
342

Fig. 8A

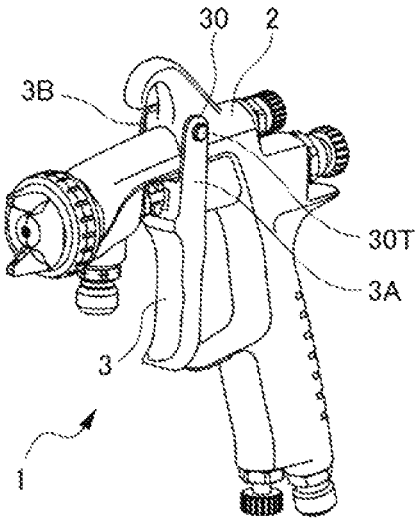


Fig. 8B

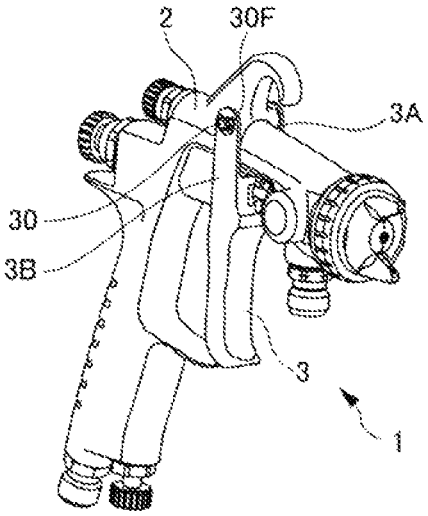
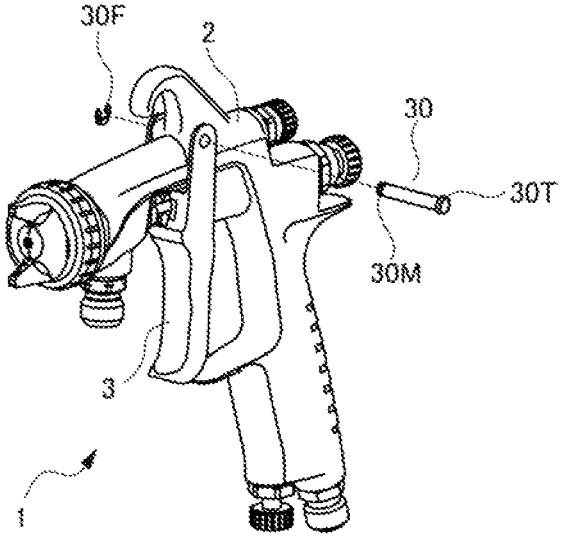


Fig. 8C



SPRAY GUN WITH IMPROVED TRIGGER RETAINING SHAFT

BACKGROUND OF THE INVENTION

The present invention relates to a spray gun and more particularly to a mounting construction of a trigger of such a spray gun.

For example, as described in Patent Literature 1 below, to spray gun which sprays an atomized mist of paint is configured so that an atomized mist of paint is sprayed from a spray nozzle which is attached to a distal end of a gun main body through a needle valve and that a flow of compressed air is delivered to a distal end of the spray nozzle to collide with paint to be sprayed for mixing therewith.

The spray gun configured in this way can spray paint which is converted into very fine particles.

As this occurs, the spray of paint from the spray nozzle and the delivery of compressed air to the distal end of the spray nozzle can be executed simultaneously by rotating the trigger mounted on the gun body.

The trigger is mounted on the gun body as shown in FIGS. **8**A, **8**B, **8**C. FIG. **8**A is a perspective view of a spray gun **1** as seen from one side thereof, FIG. **8**B is a perspective view of the spray gun **1** as seen from the other side thereof, and FIG. **8**C is an exploded view of the spray gun **1** with a shaft portion which locks a trigger of the spray gun **1** removed therefrom.

As shown in FIGS. **8**A, **8**B, **8**C, a trigger **3** has to first locking portion **3**A and a second locking portion **3**B. One end of a shaft portion **30** which is disposed so as to extend through a barrel portion **2** of a gun main body is inserted into the first locking portion **3**A, and the other end of the shaft portion **30** is inserted into the second locking portion **3**B. The shaft portion **30** is made up of a shaft member which has to head portion **30**T at an and which is inserted into the first locking portion **3**A and a groove **30**M at the other end which is inserted into the second locking portion **3**B. A snap ring **30**F is fitted in the groove **30**M.

In this configuration, the trigger **3** is mounted on the spray gun **1** so as to rotate relative to the gun main body about the shaft member as a fulcrum with the first locking portion **3**A held by the barrel portion **2** of the gun main body and the head portion T of the shaft member therebetween and the second locking portion **3**B held by the barrel portion **2** of the gun main body and the snap ring **30**F which is fitted on the retaining, shaft **30**F therebetween.

It is noted that FIGS. **8**A, **8**B, **8**C are drawn in comparison with FIGS. **1**A, **1**B, **1**C, respectively, which show an embodiment of the present invention, and configurations of the respective constituent portions of the spray gun **1** will be described when embodiments of the present invention will be described.

PRIOR ART LITERATURE

Patent Literature

Patent Literature 1: Japanese Laid-Open Publication No. H09-253538

SUMMARY OF THE INVENTION

However, the mounting construction of the trigger on the gun main body has the following drawbacks. That is, when the trigger is removed from the gun main body in, for example, carrying out maintenance work on the spray gun **1**, a special tool is needed to remove the snap ring from the shaft member, and there is possibility that the snap ring so removed may be lost. Additionally, the same drawbacks have to be encountered when the snap ring is mounted back on the shaft member.

The spray gun **1** also has an additional problem that looseness is generated between the trigger and the gun main body or between the trigger and the retaining shaft or the snap ring as a result of such a production tolerance as a variation in distance over which the first locking portion and the second locking portion of the trigger are spaced apart. With a view to solving the problem of looseness, the locking portions of the trigger are formed so as to be inclined towards each other at one ends thereof so that they temporarily approach each other to reduce the looseness. However, this is insufficient to solve or absorb completely the variation in distance between the locking portions of the trigger which is caused as one of the production tolerances leading to a problem that the looseness recurs is as result of the spray gun being used continuously.

In addition to the problem of looseness, due to a design limitation, it is difficult for a gun main body of a certain width to be used commonly on different types of spray guns. Therefore, different trigger-related parts including a trigger, a retaining shaft and the like have to be prepared for different gun main bodies which are different in width in the range of only several millimeters in order to eliminate the problem of looseness. Thus, an additional problem of cost is caused by the difficulty in making common use of a gun main body of one width on different types of spray guns. Additionally, as to the snap ring, the irregular shape thereof is exposed to the eyes of a user, which deteriorates the appearance of the snap ring. In the conventional example shown in FIG. **8**, the snap ring is laterally asymmetric and this makes the design thereof unfavorable.

The present invention has been made in view of these situations, and an object thereof is to provide a spray gun in which a trigger can be reliably mounted on as gun main body while the trigger can be mounted on and removed from the gun main body extremely easily, which can absorb production tolerances of the spray gun main body or the trigger so as to make common use of the trigger-related parts even for gun main bodies which are slightly different in width and which has a superior design.

The present invention can be understood well by knowing the following configurations.

According to one aspect of the present invention, there is provided a spray gun comprising: a gun main body; and a trigger having a first locking portion and a second locking portion, the first locking portion locked at one end of a shaft portion provided on the gun main body, the second locking portion locked at the other end of the shaft portion, the trigger operable to rotate about the shaft portion. The shaft portion comprises: a first retaining shaft disposed in a mounting hole formed in the gun main body and locked rotatably on the first locking portion of the trigger; and an elastic member disposed in the mounting hole to bias the first retaining shaft in a direction in which the first retaining shaft exits from the mounting hole. The mounting hole may be, for example, a through hole which penetrates the gun main body, or a bottomed hole formed in the gun main body.

According to one aspect of the present invention, there is provided a spray gun including a gun main body, and a trigger which has a first locking portion which is locked at one end of a shaft portion disposed to extend through the gun main body and a second locking portion which is locked at the other end of the shaft portion and which trigger is

operated to rotate about the shaft portion, wherein the shall portion is incorporated in a through hole which penetrates the gun main body and includes a first retaining shaft which is locked rotatably on the first locking portion of the trigger, a second retaining shaft which is locked rotatably on the second locking portion of the trigger, and an elastic member which is disposed between the first retaining shaft and the second retaining shaft to bias the first retaining shaft and the second retaining shall in directions in which the first retaining shaft and the second retaining shaft move away from each other.

According to one aspect of the present invention, there is provided a spray gun including a gun main body, and a trigger which has a first locking portion which is locked at one end of a shaft portion formed on the gun main body and a second locking portion which is locked at the other end of the shaft portion and which trigger is operated to rotate about the shaft portion. The shaft portion on which at least either of the first locking portion and the second locking portion of the trigger is locked includes a retaining shaft which is disposed in a bottomed hole formed in the gun main body, and an elastic member which is disposed between a bottom portion a the bottomed hole and the retaining shaft to bias the retaining shaft in a direction in which the retaining shaft moves away from the bottom portion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A, **1**B, **1**C are a schematic view which shows an external appearance of a spray gun of the present invention.

FIG. **2** is a sectional view of the spray gun of the present invention.

FIGS. **3**A, **3**B, **3**C are a sectional view which shows Embodiment 1 of a mounting construction of as trigger of the spray gun of the present invention.

FIGS. **4**A, **4**B, **4**C are a sectional view showing a mounting construction of a trigger of a spray gun according to Embodiment 2 of the present invention.

FIGS. **5**A, **5**B are as sectional view showing a mounting construction of as trigger of a spray gun according to Embodiment 3 of the present invention.

FIGS. **6**A, **6**B are a sectional view showing a mounting construction of a trigger of as spray gun according to Embodiment 4 of the present invention.

FIGS. **7**A, **7**B are a sectional view showing a mounting construction of a trigger of a spray gun according to Embodiment 5 of the present invention.

FIGS. **8**A, **8**B, **8**C are a schematic view which shows an external appearance of as conventional spray gun.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, embodiments for carrying, out the present invention (hereinafter, referred to as embodiments of the present invention) will be described in detail by reference to the accompanying drawings. In describing all embodiments of the present invention, like reference numerals will be given to like constituent elements.

Embodiment 1

FIGS. **1**A, **1**B are schematic views which show an external appearance of a spray gun of the present invention. FIG. **1**A is a perspective view of a spray gun **1** as seen from one side thereof, and FIG. **1**B is a perspective view of the spray gun **1** as seen from the other side thereof.

As shown in FIGS. **1**A, **1**B, the spray gun **1** includes a barrel portion **2**, a trigger portion **3** and a grip portion **4** (in this specification, the barrel portion **2** and the grip portion **4** are referred to together as a gun main body from time to time). The spray gun **1** is configured so that a flow of mist of paint and a flow of air are sprayed from a distal end portion (denoted by reference character A in the figures) of the barrel portion **2** so as to be mixed with each other to thereby be sprayed together by operating the trigger **3**. Here, an overall configuration of the spray gun **1** will schematically be described before the description of a mounting construction of the trigger **3** of the spray gun.

FIG. **2** is a sectional view taken along the line II-II in FIGS. **1**A, **1**B.

In FIG. **2**, compressed air is sent from the grip portion **4** of the spray gun **1** into an air valve portion **7** by way of an air nipple **5** and an air passage **6** and is sent further to the distal end portion (denoted by reference character A in the figure) of the barrel portion **2** by way of an air passage **6'**. Additionally, an air amount adjusting device **8** for compressed air is provided at a portion which lies adjacent to the air nipple **5** in the grip portion **4**. The trigger **3** can be pulled about as fulcrum α (a shaft portion **30** which will be described later) towards the grip portion **4**, and the air valve portion **7** is opened via an air valve rod **9** which is pushed by the trigger **3**, whereby the compressed air from the air passage **6** is sent to the air passage **6'**.

A needle valve **10** is mounted in the air valve rod **9**, and the needle valve **10** is formed as an extending portion which is concentric with the air valve rod **9**. In such a situation that the trigger **3** is not pulled, the needle valve **10** is pressed against a seat portion of as paint jetting port **12**P of a spray nozzle **12** which is attached to the distal end portion of the barrel portion **2** by as needle valve spring **11**, whereby the spray nozzle **12** is sealed.

A joint **13** which is mounted on the barrel portion **2** is connected to the spray nozzle **12**, and paint is supplied, through this joint **13**. Paint that is supplied to the spray nozzle **12** is jetted from the paint jetting port **12**P as a flow of mist of paint when the sealing of the spray nozzle **12** by the needle valve **10** is released.

A paint jetting amount adjusting knob **15** is provided at a rear end portion of the barrel portion **2**, so that the degree of opening between the seat portion of the paint jetting, port **12**P of the spray nozzle **12** and the needle valve **10** is adjusted by rotating, the paint jetting amount adjusting knob **15**, whereby the jetting amount of paint can be adjusted.

In addition, an air cap **16** is disposed at a distal end portion of the spray nozzle **12** in such a way as to surround the distal portion. This air cap **16** is attached to the barrel portion **2** via a cap cover **17**. An annular slit S is defined between an inner circumferential surface of the air cap **16** and an outer circumferential surface of the distal end portion of the spray nozzle **12**. Compressed air from the air passage **6'** jets a flow of air from the slit S along a circumference of the distal end portion of the spray nozzle **12** when the air valve portion **7** is opened.

A pair of horn portions **18** are formed on a distal end face of the air cap **16** in positions which face diametrically each other with the spray nozzle positioned between the horn portions. A side air hole **18**H is formed in each of the horn portions **18** of the air cap **16** so as to connect to the air passage **6'** and flows of air from these side air holes **18**H can be sprayed so as to intersect a flow of mist of paint from the spray nozzle **12**. By doing so, the flow of mist of paint from the spray nozzle **12** can be formed into an elliptic spray pattern by the flows of air from the side air holes **18**H.

A pattern expansion adjusting knob **20** is provided at as rear end portion of the barrel portion **2**, so that the degree of opening between a pattern expansion adjusting valve **21** and the seat portion is adjusted by rotating the pattern expansion adjusting knob **20**, whereby the flow rate of compressed air which is sent to the side air holes **18**H in the air cap **16** is adjusted. By doing so, a sectorial expansion of the spray pattern of paint jetted from the spray nozzle **12** can be adjusted.

In the spray gun **1** which is configured in the way described heretofore, the trigger **3**, which is operated to jet a flow of mist of paint and flows of air, has a bifurcate construction at an end portion thereof where the trigger **3** is mounted on the barrel portion **2**. In this bifurcate construction, a first locking portion **3**A and a second locking portion **3**B are provided in such a way as to hold the barrel portion **2** between the first and second locking portions **3**A and **3**B as shown in FIGS. **1**A, **1**B. In the trigger **3**, the first locking portion **3**A and the second locking portion **3**B are locked at respective end portions of a shaft portion **30** which is disposed so as to extend through the barrel portion **2**, and the trigger **3** is allowed to rotate relative to the barrel portion **2** about the shaft portion **30** as a fulcrum (denoted by a in FIG. **2**).

FIG. **1**C is an exploded view of the spray gun **1** with the trigger **3** removed therefrom as a result of removing the shaft portion **30** being removed from the spray gun **1**. As is clear from FIG. **1**C, the shaft portion **30** includes a first retaining shaft **331**, a spring **36**, and a second retaining shaft **332**.

FIG. **3**A is a sectional view taken along the line III-III in FIG. **1**. To facilitate the understanding of a configuration shown in FIG. **3**A, FIG. **3**B shows a state of the shaft portion **30** which results when the pressing of the trigger **3** is released, and FIG. **3**C shows a state of the shaft portion **30** which results immediately before the shaft portion **30** is brought into engagement with the trigger **3**.

In FIG. **3**A, a through hole **31** as a mounting hole is provided in the barrel portion **2** of the gun main body in a direction which intersects a center line of the barrel portion **2** at right angles. The through hole **31** is formed so that a diameter (d) at a central portion in the direction of the center line is small and a diameter (D) at both end portions thereof is large. A tapered step portion **32** is provided between the small diameter (d) and the large diameter (D). In the following description, a through hole at the central portion of the through hole **31** which has the small diameter is referred to as a small-diameter through hole **31**P, and through holes at both the end portions of the through hole **31** which have the large diameter are referred to as a first through hole **31Q1** and a second through hole **31Q2**, respectively.

As shown in FIG. **3**A, the first retaining shaft **331** is disposed in the first through hole **31Q1** of the large diameter, and the second retaining shaft **332** is disposed in the second through hole **31Q2** of the large diameter.

The first retaining shaft **331** is configured to move in an axial direction within a predetermined range in the first through hole **31Q1** of the large diameter. A projecting shaft **341** is formed coaxially with the first retaining shaft **331** on an end face thereof which faces the through hole **31**P of the small diameter. This projecting shaft **341** has an outside diameter which is smaller than a bore diameter of the through hole **31**P of the small diameter. This projecting shaft **341** is designed to be disposed within the through hole **31**P of the small diameter at least at a distal end of the projecting shaft **341** while the first retaining shaft **331** moves in the first through hole **31Q1** of the large diameter. A gap is defined between the projecting shaft **341** of the first retaining shaft **331** and the through hole **31**P of the small diameter, and this gap is sized so that the spring **36**, which will be described later, can be inserted therein.

A locking shaft **351** is formed coaxially with the first retaining shaft **331** on an end face of the first retaining shaft **331** which is opposite to the end face where the projecting shaft **341** is formed. This locking shaft **351** has somehow such a diameter that enables the locking shaft **351** to be inserted loosely in a hole **3**AH which is formed in the first locking portion **3**A of the trigger **3**.

The locking shaft **351** is formed somehow in such a length that substantially prevents the projection of the locking shaft **351** from the first through hole **31Q1** of the large diameter when the first retaining shaft **331** is pushed sufficiently into an interior of the first through hole **31Q1**. This is because the first locking portion **3**A of the trigger **3** can be brought into engagement with the locking shaft **351** (refer to FIG. **3**C).

The second retaining shaft **112** is configured to move in an axial direction within a predetermined range in the second through hole **31Q2** of the large diameter, A projecting shaft **342** is formed coaxially with the second retaining shaft **332** on an end face thereof which faces the through hole **31**P of the small diameter. This projecting shaft **342** has an outside diameter which is smaller than a bore diameter of the through hole **31**P of the small diameter. This projecting shaft **342** is designed to be disposed within the through hole **31**P of the small diameter at least at a distal end of the projecting shaft **342** while the second retaining shaft **332** moves in the second through hole **31Q2** of the large diameter. A gap is defined between the projecting shaft **342** of the second retaining shaft **332** and the through bole **31**P of the small diameter, and this gap is sized so that the spring **36**, which will be described later, can be inserted therein.

A locking shaft **352** is formed coaxially with the second retaining shaft **332** on an end face of the second retaining shaft **332** which is opposite to the end face where the projecting shaft **342** is formed. This locking shaft **352** has somehow such a diameter that enables the locking shaft **352** to be inserted loosely in a hole **31Q1** which is formed in the second locking portion **332** of the trigger **3**.

The locking shaft **352** is formed somehow in such a length that substantially prevents the projection of the locking, shaft **352** from the second through hole **31Q2** of the large diameter when the second retaining shaft **332** is pushed sufficiently into an interior of the second through hole **31Q2**. This is because the second locking portion **3**B of the trigger **3** can be brought into engagement with the locking shaft **352** (refer to FIG. **3**C).

The spring **36** having an outside diameter which is almost equal to the bore diameter of the through hole **31**P of the diameter is inserted into the through hole **31**. This spring **36** is disposed so that the projecting shaft **341** of the first retaining shaft **331** is inserted into one end portion of the spring **36** and the projecting shaft **342** of the second retaining shaft **332** is inserted into the other end portion of the spring **36**. The spring **36** is disposed between the first retaining, shaft **331** which is locked by the first locking portion **3**A of the trigger **3** and the second retaining shaft **332** which is locked by the second locking portion **3**B of the trigger **3**, whereby the first retaining shaft **331** and the second retaining shaft **332** are biased in directions in which the first retaining shaft **331** and the second retaining shaft **332** move away from each other.

In the first retaining shaft **331**, the spring **36** and the second retaining shaft **332** in the through hole **31**, when the pressures on the first locking portion **3**A and the second

locking portion **3**B of the trigger **3** are released, with the first retaining shaft **331** positioned within the first through hole **31**Q1 of the large diameter, the spring **36** has such a length that causes the second retaining shaft **332** to jump out of the second through hole **31**Q2 of the large diameter as shown in FIG. **3**B. By adopting this configuration, when attempting to dispose the second retaining shaft **332** in the second through hole **31**Q2 of the large diameter, too, the spring **36** is contracted, and the compression force applied to the spring **36** then generates a force in the spring **36** which acts in directions in which the first retaining shaft **331** and the second retaining shaft **332** move away from each other.

While the first retaining shaft **331**, the spring **36** and the second retaining shaft **332** are described as being independent separate members, it is preferable that the first retaining shaft **331**, the spring **36** and the second retaining shaft **332** cannot be detached from each other for example by adopting a configuration in which the spring **36** is locked on the first retaining shaft **331** at one end of the spring **36** by inserting the one end into a hole formed in the first retaining shaft **331** and is locked on the second retaining shaft **332** at the other end of the spring **36** by inserting the other end into a hole formed in the second retaining shaft **332**. This is because the configuration can keep the first retaining shaft **331**, the spring **36** and the second retaining shaft **332** in an integrated state to prevent them from being disengaged individually from the through hole **31** when the trigger **3** is removed from the shaft portion **30**.

According to the mounting construction of the trigger **3** which is configured as shown in FIG. **1**A, the first retaining shaft **331** and the second retaining shaft **332** can be pushed into the through hole **31** against the biasing force of the spring **36**, whereby the trigger **3** can be disposed so that the first locking portion **3**A and the second locking portion **3**B are easily positioned to be opposite to the first retaining shaft **331** and the second retaining shaft **332**, respectively.

Thereafter, the locking shaft **351** of the first retaining shaft **331** and the locking shall **352** of the second retaining shaft **332** are inserted into the bole **3**AH in the first locking portion **3**A and the hole **3**BH in the second locking portion **3**B of the trigger **3**, respectively, by the biasing force of the spring **36**, and the trigger **3** is then locked on the shaft portion **30** of the barrel portion **2** which is comprised by the first retaining shaft **331**, the spring **36** and the second retaining shaft **332**, whereby the trigger **3** can rotate about the shall portion **30** as a fulcrum. According to this configuration, for example, even though the distance at which the first locking portion **3**A and the second locking portion **3**B of the trigger **3** are spaced away from each other differs among the triggers due to the production tolerances of the trigger-related parts, since the first retaining shaft **331** is closely attached to the first locking portion **3**A and the second retaining shaft **332** is closely attached to the second locking portion **3**B by the biasing force of the spring **36**, the configuration can provide an advantage that the drawback caused by the production tolerances can be eliminated.

The first retaining shaft **331**, the spring **36** and the second retaining shaft **332** which are disposed in the through hole **31** in the barrel portion **2** can be configured so as not to be detached from each other (i.e. the first retaining shall **331**, the spring **36** and the second retaining shaft **332** can be configured so as not to be detached from each other easily after they are attached to each other), whereby these trigger-related parts can be prevented from being disengaged individually from the through hole **31**.

Consequently, according to the mounting construction of the trigger **3** which is configured in the way described heretofore, the trigger **3** can be mounted reliably on the gun main body, while the trigger **3** can easily be mounted on and removed from the gun main body.

Since the shaft portion **30** requires, for example, no snap ring, it is possible to obtain the spray gun which has a superior design.

Embodiment 2

FIGS. **4**A, **4**B, **4**C are drawings showing a mounting construction of a trigger according to Embodiment 2 of the present invention and depict the mounting construction in such a way as to correspond to FIGS. **3**A, **3**B, **3**C, respectively.

When comparing the trigger mounting construction of Embodiment 2 shown in FIGS. **4**A, **4**B, **4**C with that of Embodiment 1 shown in FIGS. **3**A, **3**B, **3**C, a difference therebetween resides in the configuration of the second through hole **31**Q2 of the large diameter shown in FIGS. **3**A, **3**B, **3**C, In Embodiment 2 shown in FIGS. **4**A, **4**B, **4**C, a second through hole **31**Q2 includes an extended portion **31**PE which is an extension of a through hole **31**P of a small diameter, or is formed by slightly extending the through hole **31**P of the small diameter in Embodiment 1 towards a surface of a barrel portion **2** and a tapered hole **31**QT which expands gradually diametrically from an end portion of the extended portion **31**PE towards the surface of the barrel portion **2**.

In a through hole **31** which is configured as described above, the tapered hole **31**QT can be cored with the use of a core in die casting, and this provides an advantage that the through hole **31** of Embodiment 2 can have a simpler configuration than that of the through hole **31** of Embodiment 1. Namely, while the configuration of the through hole of Embodiment 1 requires the gun main body to be machined front both the sides thereof, the through hole of Embodiment 2 requires a gun main body to be machined from only one side thereof where a first retaining shaft is inserted, according to FIG. **4**.

A second retaining shaft **332** is formed so as to have an outside diameter which is almost equal to a bore diameter of the through hole **31**P of the small diameter, and a flange portion **355** is formed at a boundary with a locking shaft **352**.

The flange portion **355** has its diameter larger than that of locking shaft **352** such that the locking shaft **352** can be locked securely to the second locking portion **3**B of the trigger **3**.

Additionally, while the flange portion **355** is brought into abutment with a side surface of the tapered hole **31**QT when the second retaining shall **332** is pushed sufficiently into the second through hole **31**Q2, a diameter of the flange portion **355** is sot to such an extent that the locking shall **352** does not substantially project from the second through hole **31**Q2 then (refer to FIG. **4**C). This is because a second locking portion **3**B of a trigger **3** is allowed to be brought into engagement with the locking shaft **352**.

When adopting the trigger mounting construction described above, too, the same advantage as that obtained in Embodiment 1 can be obtained.

Embodiment 3

FIGS. **5**A, **5**B are drawings showing a mounting construction of a trigger according to Embodiment 3 of the present invention and depict the mounting construction in such a way as to correspond to FIGS. **3**A, **3**C, respectively.

When comparing the trigger mourning construction of Embodiment 3 shown in FIGS. **5**A, **5**B with that of Embodiment 1 shown in FIGS. **3**A, **3**C, a difference therebetween resides in a configuration in which a through hole **31** is made up of only through holes **31**Q**1**, **31**Q**2** of a large diameter and the through hole **31**P of the small diameter is not formed.

In the through holes **31**Q**1**, **31**Q**2** of the large diameter, a first retaining shaft **331**, a spring **36** and a second retaining shall **332** are disposed sequentially in that order from one end to the other end of the through hole **31** as done in Embodiment 1. The spring **36** is configured to have an outside diameter which is almost the same as a bore diameter of the through hole **31**.

Additionally, while locking shafts **351**, **352** are formed on the first retaining shall **331** and the second retaining shaft **332**, respectively, projecting shafts (those denoted by reference numerals **341**, **342** in FIG. **3**) are not formed thereon. This is because a through hole of a small diameter (that denoted by reference numeral **31**P in FIG. **3**) is not formed in the through hole **31**.

When adopting the trigger mounting construction described above, too, the same advantage as that obtained in Embodiment 1 can be obtained.

Embodiment 4

FIGS. **6**A, **6**B are drawings showing a mounting construction of a trigger according to Embodiment 4 of the present invention and depict the mounting construction in such a way as to correspond to FIGS. **3**A, **3**C, respectively.

When comparing the trigger mounting construction of Embodiment 4 shows in FIGS. **6**A, **6**B with that of Embodiment 1 shown in FIGS. **3**A, **3**C, a difference therebetween resides in a configuration in which a through hole **31** is made up of only through holes **31**Q**1**, **31**Q**2** of a large diameter and the through bole **31**P of the small diameter is not formed, in a similar manner in FIGS. **5**A, **5**B.

However, in the trigger mounting construction which is configured differently from that shown in FIGS. **5**A, **5**B, projecting shafts **341**, **342** are formed on a first retaining shaft **331** and a second retaining shall **332**, respectively. A spring **36** which is disposed between the first retaining shaft **331** and the second retaining shaft **332** is formed to have a bore diameter which is almost equal to an outside diameter of the projecting shafts **341**, **342** so that the projecting, shaft **341** of the first retaining shaft **331** and the projecting shaft **342** of the second retaining shaft **332** are allowed to be inserted into the spring **36**.

When adopting the trigger mounting construction described above, too, the same advantage as that obtained in Embodiment 1 can be obtained.

Embodiment 5

FIG. **7**A is a drawing showing a minting construction of **3** trigger according to Embodiment 5 of the present invention and depicts the mounting construction in such a way as to correspond to FIG. **3**A.

When comparing the trigger mounting construction of Embodiment 5 shown in FIG. **7** with the trigger mounting construction of Embodiment 1 shown in FIG. **3**A, a difference therebetween resides firstly in a configuration in which holes in which a first retaining shaft **331** and a second retaining shaft **332** are incorporated are formed as a bottomed hole **31**A and a bottomed hole **31**B (mounting holes). Because of this, the through hole **31** shown in FIG. **3**A is not formed in this embodiment.

Additionally, a spring **36**A is disposed in the bottomed hole **31**A in which first retaining shaft **331** is incorporated so as to bias the first retaining shaft **331** in a direction in which the first retaining shaft **331** moves away from a bottom portion **41**A of the bottomed hole **31**A. A spring **36**B is disposed in the bottomed hole **31**B in which the second retaining shaft **332** is incorporated so as to bias the second retaining shaft **332** in a direction in which the second retaining shaft **332** moves away from a bottom portion **41**B of the bottomed hole **31**B.

As this occurs, a projecting portion **42**A is formed on the bottom portion **41**A of the bottomed hole **31**A so as to position the spring **36**A, and this projecting portion **42**A is inserted into the spring **36**A. Similarly, a projecting portion **42**B is formed on the bottom portion **41**B of the bottomed hole **31**B so as to position the spring **36**B, and this projecting portion **42**B is inserted into the spring **36**B.

FIG. **7**B shows a modified example made to the configuration shown in FIG. **7**A. In this modified example, for example, the first retaining shaft **331** shown in FIG. **7**A is not configured in the way described above but is configured as a projecting member **50** which is formed integrally with a barrel portion **2**. When this configuration is adopted, the bottomed hole **31**A, the first retaining shaft **331** and the spring **36**A are not used in the barrel portion **2**, which can provide an advantage that the resulting configuration becomes simple. Meanwhile, alternative configuration that the bottomed hole **31**A, the first retaining shaft **331** and the spring **36**A are used in the barrel portion **2**, while the second retaining shaft **332** can be configured as a projecting member **50** formed integrally with a barrel portion **2**.

When adopting the trigger mounting construction described above, too, the same advantage as that obtained in Embodiment 1 can be obtained.

It should be noted that the first retaining shaft **331** or the second retaining shaft **332** can be configured as a projecting member **50** formed integrally with a barrel portion **2** in any one of Embodiments 1-4.

(1) According to one aspect of the present invention, there is provided as spray gun including a gun main body, and a trigger which has a first locking portion which is locked at one end of a shaft portion disposed to extend through the gun main body and a second locking portion which is locked at the other end of the shaft portion, and which trigger is operated to rotate about the shall portion. The shall portion is incorporated in a through hole which penetrates the gun main body and includes a first retaining shaft which is locked rotatably on the first locking portion of the trigger, a second retaining shaft which is locked rotatably on the second locking portion of the trigger, and an elastic member which is disposed between the first retaining shaft and the second retaining shaft to bias the first retaining, shaft and the second retaining shaft in directions in which the first retaining shaft and the second retaining shaft move away from each other.

(2) According to one aspect of the present invention, there is provided the spray gun according to aspect (1), wherein the first retaining shaft is locked on the first locking portion of the trigger by inserting a projection formed on the first retaining shaft in a hole formed in the first locking portion and wherein the second retaining shaft is locked on the second locking portion of the trigger by inserting a projection formed on the second retaining shaft in a hole formed in the second rocking portion.

(3) According to one aspect of the present invention, there is provided the spray gun according to aspect (1) or (2), wherein the elastic element is a spring.

(4) According to one aspect of the present invention, there is provided the spray gun according to aspect (3), wherein the spring is locked on the first retaining shaft and the second retaining shaft.

(5) According to one aspect of the present invention, there is provided the spray gun according to any one of aspects (1)-(4), wherein the through hole is such that a diameter at both longitudinal end portions is larger than a diameter at a central portion of the through hole.

(6) According to one aspect of the present invention, there is provided the spray gun according to any one of aspects (1)-(4), wherein the through hole has the same diameter along a longitudinal direction of the through hole.

(7) According to one aspect of the present invention, there is provided the spray gun according to any one of aspects (1)-(4), wherein the through hole is formed so that a diameter at an end portion where the first retaining shaft is disposed differs from a diameter at the other end portion where the second retaining shaft is disposed, and wherein the first retaining shaft and the second retaining shaft have diameters which match the corresponding diameters of the through hole.

(8) According to one aspect, there is provided a spray gun including a gun main body, and a trigger which has a first locking portion which is locked at one end of a shaft portion formed on the gun main body and a second locking portion which is locked at the other end of the shaft portion and which trigger is operated to rotate about the shaft portion. The shaft portion on which at least either of the first locking portion and the second locking portion of the trigger is locked includes a retaining shaft which is disposed in a bottomed hole formed in the gun main body, and an elastic member which is disposed between a bottom portion of the bottomed hole and the retaining shaft to bias the retaining shaft in a direction in which the retaining shaft moves away from the bottom portion.

(9) According to one aspect, there is provided the spray gun according to the aspect (8), wherein the shaft portion includes a projecting member which is formed on the gun main body, and the first locking portion or the second locking portion is locked on the projecting member.

(10) According to one aspect, there is provided a spray gun comprising: a gun main body: and a trigger having a first locking portion and a second locking portion, the first locking portion locked at one end of a shaft portion provided on the gun main body, the second locking portion locked at the other end of the shaft portion, the trigger operable to rotate about the shaft portion, wherein the shaft portion comprises: a first retaining shaft disposed in a mounting hole formed in the gun main body and locked rotatably on the first locking portion of the trigger; and an elastic member disposed in the mounting hole to bias the first retaining shaft in a direction in which the first retaining shaft exits from the mounting hole.

According to the configurations that have been described above, it is possible to obtain the spray gun in which the trigger can be reliably mounted on the gun main body while the trigger can be mounted on and removed from the gun main body extremely easily, which can absorb production tolerances of the spray gun main body and the trigger, whereby the trigger-related parts can be made common use of even for different spray guns whose gun main bodies have slightly different widths, and which has the superior design.

Thus, while the invention has been described by the use of the embodiments, needless to say, the technical scope of the invention is not limited to the scopes of the embodiments described heretofore. It is obvious to those skilled in the art to which the invention pertains that various modifications or improvements can be made to the embodiments. Additionally, it is also obvious from claims to be made separately that those modified or improved embodiments can also be included in the technical scope of the invention.

The present application claims priority to Japanese Patent Application No. 2013-081664 filed on Apr. 9, 2013. The entire disclosure of Japanese Patent Application No. 2013-081664 filed on Apr. 9, 2013 including specification, claims, drawings and summary is incorporated herein by reference in its entirety.

The entire disclosure of Japanese Laid-Open publication No. 1109-253538 including specification, claims, drawings and summary is incorporated herein, by reference in its entirety.

DESCRIPTION OF REFERENCE NUMERALS

1 spray gun; **2** barrel portion; **3** trigger; **3**A first locking portion; **3**B second locking portion; **4** grip portion; **5** air nipple; **6**, **6'** air passage; **7** air valve portion; **8** air amount adjusting device; **9** air valve rod; **10** needle valve; **11** needle valve spring; **12** spray nozzle; **12**P paint jetting port; **13** joint; **15** paint jetting amount adjusting knob; **16** air cap; **17** cap cover; **18** horn portion; **18**H side air hole; **20** pattern expansion adjusting knob; **21** pattern expansion adjusting valve; **30** shaft portion; **31** through hole; **31**A, **31**B bottomed hole; **31**P through hole of small diameter; **31**Q**1** first through hole of large diameter; **31**Q**2** second through hole of large diameter; **32** step portion; **331** first retaining shaft; **332** second retaining shaft; **341**, **342** projecting shaft; **351**, **352** locking shaft; **355** flange portion; **36**, **36**A, **36**B spring; **50** projecting member.

What is claimed:

1. A spray gun comprising:

a gun main body;

a through hole penetrating the gun main body;

a shaft assembly in the through hole, the shaft assembly including:

a first retaining shaft,

a second retaining shaft, and

a single elastic member between the first retaining shaft and the second retaining shaft biasing both the first retaining shaft and the second retaining shaft in a direction in which the first retaining shaft and the second retaining shaft move away from each other and in which the first retaining shaft and the second retaining shaft exit from the through hole;

a trigger having a first locking portion rotatably locked onto the first retaining shaft, and a second locking portion rotatably locked on the second retaining shaft, wherein the trigger is operable to rotate about the first and second retaining shafts.

2. The spray gun according to claim **1**, wherein

the first locking portion of the trigger includes a hole, and the first retaining shaft includes a projection, and the first retaining shaft is locked on the first locking portion of the trigger by insertion of the projection formed on the first retaining shaft in the hole formed in the first locking portion, and

the second locking portion of the trigger includes a hole, and the second retaining shaft includes a projection, and the second retaining shaft is locked on the second locking portion of the trigger by insertion of the projection formed on the second retaining shaft in the hole formed in the second locking portion.

3. The spray gun according to claim **1**, wherein

the elastic element comprises a spring.

4. The spray gun according to claim 3, wherein
the spring is locked on the first retaining shaft and the second retaining shaft.

5. The spray gun according to claim 1, wherein
the through hole is such that a diameter at both longitudinal end portions is larger than a diameter at a central portion of the through hole.

6. The spray gun according to claim 1, wherein
the through hole has the same diameter along a longitudinal direction of the through hole.

7. The spray gun according to claim 1, wherein
the through hole is formed such that a diameter at an end portion where the first retaining shaft is disposed differs from a diameter at the other end portion where the second retaining shaft is disposed, and wherein
the first retaining shaft and the second retaining shaft have diameters which match the corresponding diameters of the through hole.

8. A spray gun comprising:
a gun main body;
a through hole penetrating the gun main body;
a shaft assembly in the through hole, the shaft assembly including:
a first retaining shaft,
a second retaining shaft, and
an elastic member between the first retaining shaft and the second retaining shaft biasing both the first retaining shaft and the second retaining shaft in a direction in which the first retaining shaft and the second retaining shaft move away from each other and in which the first retaining shaft and the second retaining shaft exit from the through hole;
a trigger having a first locking portion rotatably locked onto the first retaining shaft, and a second locking portion rotatably locked on the second retaining shaft, wherein the trigger is operable to rotate about the first and second retaining shafts,
wherein the through hole is such that a diameter at both longitudinal end portions is larger than a diameter at a central portion of the through hole.

9. A spray gun comprising:
a gun main body;
a through hole penetrating the gun main body;
a shaft assembly in the through hole, the shaft assembly including:
a first retaining shaft,
a second retaining shaft, and
an elastic member between the first retaining shaft and the second retaining shaft biasing both the first retaining shaft and the second retaining shaft in a direction in which the first retaining shaft and the second retaining shaft move away from each other and in which the first retaining shaft and the second retaining shaft exit from the through hole;
a trigger having a first locking portion rotatably locked onto the first retaining shaft, and a second locking portion rotatably locked on the second retaining shaft, wherein the trigger is operable to rotate about the first and second retaining shafts,
wherein the through hole is formed such that a diameter at an end portion where the first retaining shaft is disposed differs from a diameter at the other end portion where the second retaining shaft is disposed, and
wherein the first retaining shaft and the second retaining shaft have diameters which match the corresponding diameters of the through hole.

10. A spray gun comprising:
a gun main body;
a mounting hole in the gun main body, the mounting hole having a bottom;
a projection member formed integrally on the gun main body;
a shaft assembly in the mounting hole, the shaft assembly including:
a first retaining shaft, and
an elastic member between the first retaining shaft and the bottom of the mounting hole biasing the first retaining shaft in a direction in which the first retaining shaft moves away from the bottom of the mounting hole;
a trigger having a first locking portion rotatably locked onto the first retaining shaft, and a second locking portion rotatably locked on the projection member, wherein the trigger is operable to rotate about the first retaining shaft and the projection member.

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